The Supply of Doctors in Australia: Is There A Shortage?

Abhaya Kamalakanthan & Sukhan Jackson. The Supply of Doctors in Australia: Is There A Shortage? Discussion Paper No. 341 , May 2006, School of Economics, The University of Queensland, Queensland

Abstract

Many countries around the world are presently reporting a shortage of doctors. To understand the situation better, this paper reviews the current English language literature on the supply of doctors in developed and developing countries with a special interest in Australia. The definition of doctor shortage and the accepted ratio of patients to full-time equivalent (FTE) doctors that is followed in this paper, is the one that is provided by the Australian Government's Department of Health and Ageing. The issue of supply imbalance with respect to doctors is one that is particularly controversial in Australia, with some policy-makers arguing that it is a problem of under-utilisation of existing doctors, not under supply. The paper focuses on the literature on (1) mobility issues relating to geographical and sectoral imbalances, (2) incentive issues (monetary and non-monetary) relating to medical specialisation imbalance and (3) government regulation issues relating to geographical, sectoral and professional specialisation imbalances. The paper offers some suggestions to deal with the problem of supply imbalance. One of the key findings is that developed countries such as Australia cannot continue to rely on foreign-born overseas trained doctors to fill the gaps in supply. Hence, to solve the medical workforce crisis, Australia will have to increase the number of doctors being trained.

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1 INTRODUCTION

Many countries around the world are presently reporting a shortage of doctors. One such country is Australia. The usual reasons given for a shortage of doctors in economically developed countries like Australia and Canada include an increase in the number of physicians migrating to other countries, the early retirement of the baby-boomer generation of doctors, and reduced hours worked by those doctors opting for a more relaxed lifestyle. In addition, some doctors these days are also choosing less demanding specialties, and restricting their practices to particular types of cases or services (Stoddart & Barer, 1999).

The definition of doctor shortage this paper follows is provided by the Australian Government's Department of Health and Ageing. The department defines a district of workforce shortage as a geographic area in which the population's demand for healthcare is not fully met. Population demands are considered not fully met when a community has less access than the national average to medical services. In other words, in a district of workforce shortage, the ratio of full-time equivalent (FTE) doctors to patients would be greater than 0.71:1,000 (Australian Department of Health and Ageing, 2005). We accept that this ratio of patients to FTE doctors as set by the Australian Government is the official measure of over and under supply in this country. Thus in Australia, districts of workforce shortage are regional rural and remote areas, as well as outer metropolitan areas in capital cities that are experiencing doctor shortages (Australian Department of Health and Ageing, 2005).

The OECD (Organisation for Economic Co-operation and Development), of which Australia is a member, accepts that its member countries have different benchmarks by which physician shortages and surpluses are defined. This benchmark could be a minimum physician-to-patient ratio or a target number of physicians per capita in rural or deprived urban areas (Simoens & Hurst, 2006). In England for example, the National Health Service Plan has set a target of 0.56 FTE primary care physicians per 1,000 population weighted for need in each area of England (Secretary of State for Health, 2000). Similarly, in the U.S., a range of physician requirements of 0.6 to 0.8 primary care physicians per 1,000 population has been proposed (Council on Graduate Medical Education, 1994).

Of relevance to policy-making is the point raised by Hawthorne & Birrell (2002), along with other observers such as Prideaux (2001) that Australia is experiencing a doctor shortage today because of policy choices made in the past. “Throughout the past decade medical workforce planning in Australia has been dominated by the view that there are too many doctors” (Hawthorne *et al.*, 2002, p. 55). Concerns were raised in 1992 at Australia’s ‘persistent over supply of doctors’, with doctor/patient ratios increasing by approximately 67% over a 20 year period (Hawthorne *et al.*, 2002). A major condition that led to this perceived over supply was an increase in the number of foreign-born overseas trained doctors securing professional registration.

However, the issue of surplus is controversial. Hawthorne *et al.* (2002) argue that various past policies have resulted in a considerable reduction over the years in the number of doctors, and general practitioners (GPs) in particular. Some government officials and medical school representatives agree with this standpoint but there are others who disagree.[1] Rather, they argue that the problem appears because existing doctors are being under-utilised, not because there is an under supply.

To understand the situation better, we review the current literature on the supply of doctors in developed and developing countries with a special interest in Australia. Where relevant, we will focus on the supply of the GP - defined by the Royal Australian College of General Practitioners (RACGP) as a medical practitioner who provides primary comprehensive and continuing care to patients and their families within the community (Britt, Miller, Knox, Charles, Valenti, Henderson, Pan, Sutton & Harrison, 2002). Finally we will look at the main suggestions offered so far in the literature to deal with the problem of supply imbalance. Before the literature is reviewed however, it is important to briefly discuss some of the differences in definition between the notions of demand and need in economics. This paper focuses on the concept of demand.

Conventional demand theory assumes that consumers are sovereign, well informed, and make rational choices between different goods and services in order to maximise their utility (Mooney, 2003). However, it is difficult to apply conventional demand theory in its exact form in health economics, because often there is uncertainty and information asymmetry. Therefore, with respect to healthcare, Grossman (1972) suggests that

consumers' demand is derived from their perception of their optimal level of health. In other words, individuals demand healthcare because they are unsatisfied with their current health state and wish to reach some higher health state, which they desire.

Conversely, consumers may be unaware of their current and future health states, and hence would require a doctor to supply them with the necessary information for them to make a rational decision regarding their treatment choices (Mooney, 2003). This approach to healthcare, which is a merit good, is known as the 'needs' approach. A merit good is defined by Margolis (1982) as any item of public expenditure that is socially reasonable, but cannot be accounted for within the ordinary economic theory of demand. Thus, economists see need as an evaluative, normative notion that has some objective behind it. Need is not absolute or finite, rather it is dynamic and tends to grow over time (Mooney, 2003). Its growth can also be a function of the growth in healthcare supply. Because some needs will be more important than others, the extent to which certain needs are met will be a function of the marginal costs and benefits of doing so. This entails the performance of a cost-benefit analysis.

Hence, consumer sovereignty, and therefore demand, clearly conflicts with the concept of need. However, demand at least possesses the crucial feature where individuals can assess their own benefits, and so is easier to handle in comparison to the concept to need, which is not only difficult to understand, but also requires a third party to be involved in the valuing process (Mooney, 2003). Therefore, this paper will approach the supply imbalance problem from the demand rather than the needs perspective.

2 IS THERE A SUPPLY IMBALANCE OF DOCTORS?

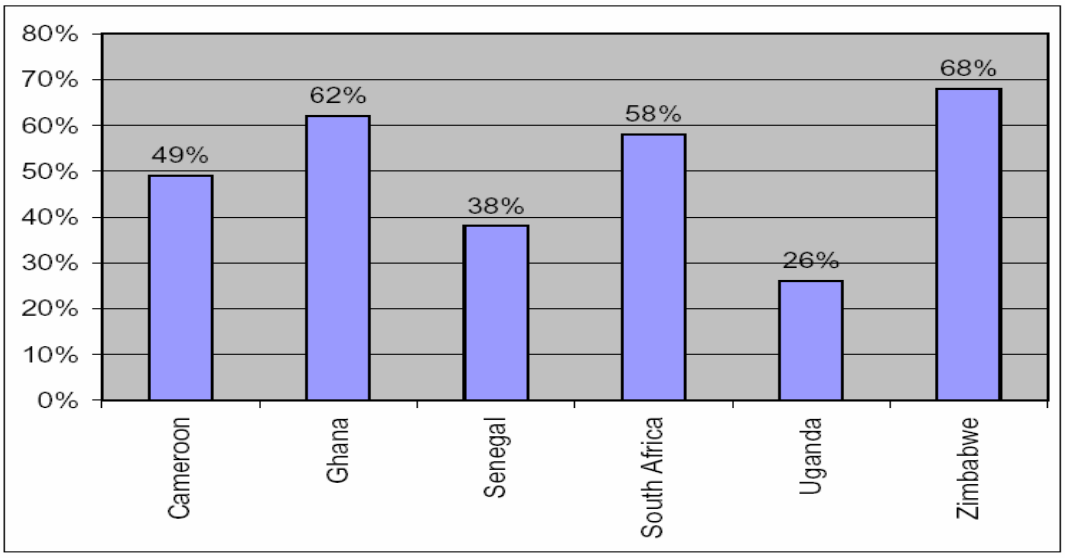
A definition of supply imbalance from an economic perspective is given in the World Health Organization (WHO) paper by Zurn, Dal Poz, Stilwell & Adams (2004), who explain that imbalance occurs when the quantity of a given skill supplied by the workforce and quantity demanded by employers diverge at the existing market condition. In other words, a surplus or shortage is the result of disequilibrium between the demand and supply for that particular labour. Zurn *et al.* (2004) also suggest that a typology of supply imbalance of the medical workforce could be constructed. Of the numerous types of imbalances that could be identified, perhaps the most concerning are those relating to geography (urban and rural areas), government and private sectors, and to some extent professional specialisation. Our review of the literature is limited to these three areas.

Of relevance to policy-making are the literature on (1) mobility issues relating to geographical and sectoral imbalances, (2) incentive issues (monetary and non-monetary) relating to medical specialisation imbalance and (3) government regulation issues relating to geographical, sectoral and professional specialisation imbalances. The literature that addresses the supply imbalance of the medical workforce is scarce as noted by Wharrad & Robinson (1999), even though international organisations such as the WHO and the World Bank have long recognised that the supply imbalance of doctors is a fundamental problem in many countries.

According to the World Bank's *World Development Report 1993: Investing in Health*, the primary reasons for the supply imbalance of doctors in many countries include over-concentration of medical specialists but not enough primary care providers, and a disproportionate number of the healthcare workforce employed in urban areas (World Bank, 1993). As well, training in public health was neglected, as were health policy and health management; and the cost of medical training was subsidised by public revenue even though many physicians work in the private sector and earn relatively high incomes (World Bank, 1993). Although the report is now outdated, many of its findings are still true in most countries. Having not heeded the warnings on supply imbalance, governments in many countries are now forced to face the consequences of not only dealing with an unequal allocation of doctors, but also a shortage of GPs, the primary care providers.

More recent studies by the WHO not only support the findings of the World Bank report, but also raise additional reasons for the supply imbalance. For example, recent WHO papers by Diallo, Zurn, Gupta & Dal Poz (2003) and Zurn *et al.* (2004) have brought to our attention that the out-migration of doctors has created considerable difficulties for some developing countries desperate to provide adequate coverage of the essential healthcare services. This problem, commonly known as 'brain drain', can be external (out-migration to another country) and internal (rural-urban migration within a country). Many African doctors from the countries shown in Figure 1 for instance migrate within the continent, and mostly to Southern African states, where salaries are often higher.

Figure 1: Percentage of African medical practitioners who intend to migrate



Source: Vujicic, Zurn, Diallo, Adams & Dal Poz, 2004, 'The role of wages in the migration of health care professionals from developing countries', *Human Resources for Health*, p. 11.

The Australian Department of Health and Ageing provides a definition of GP shortage that is similar to its description of doctor shortage. Districts of workforce shortage for GPs are determined by comparing their supply of GPs with the national average supply. The national average is the ratio of FTE GPs to population. The department considers 0.71:1,000 to be the standard GP to population ratio (the GP figure includes salaried practitioners and is based on FTEs), and uses this as a measure to demonstrate comparative workforce shortage (Australian Department of Health and Ageing, 2005). This information is based on Medicare billing data and the latest Australian Bureau of Statistics population data, and is updated quarterly. All Aboriginal Medical Services and after-hours-only services are considered districts of workforce shortage, regardless of their geographic location (Australian Department of Health and Ageing, 2005).

The Robin Hood Index has been used by Gravelle & Sutton (1998) and Kennedy, Kawachi & Prothrow-Stith (1996) to measure the unequal allocation of doctors, and is calculated as the number of GPs per person divided by the crude mortality rate (Wilkinson, 2000; Wilkinson & Symon, 1999). From their studies of the supply of GPs in Australia based on the Robin Hood Index, Wilkinson (2000) and Wilkinson *et al.* (1999) found some interesting results. The findings show that on average, there are approximately 920 people per full-time GP in Australia.

Given that the Australian Department of Health and Ageing considers 0.71:1,000 to be the standard GP to population ratio, the findings of Wilkinson (2000) and Wilkinson *et al.* (1999) seem to suggest that on average, there is an over supply of GPs in Australia. In fact, a state-by-state comparison found that three states, namely South Australia, New South Wales (NSW) and the Australian Capital Territory (ACT) were relatively over supplied. The remaining states, namely Queensland, Western Australia (WA), Victoria, Tasmania, and the Northern Territory (NT) were relatively under supplied. Adjusted for estimated demand, the findings show that the ACT is over supplied by 71% in comparison to the rest of Australia, while WA is under supplied by 15% (Wilkinson, 2000).

In Australia, not only is the allocation of GPs between and within states and territories unequal, but also it is clear that capital cities are greatly over supplied when compared to the rural and remote areas of Australia (Wilkinson, 2000; Wilkinson *et al.*, 1999). Indeed, the Australian Department of Health and Ageing supports this view, and asserts that most

rural and regional areas and many outer metropolitan areas in the capital cities are considered to be the districts of workforce shortage for GPs. The districts of workforce shortage for general practice do not generally include the inner metropolitan areas of the capital cities. Examples of districts of workforce shortage for GPs include Armidale, Broken Hill, Coffs Harbour, Dubbo, Goulburn, Kempsey, Lismore, Maitland, Port Stephens, Tamworth, Singleton, Wagga Wagga, Katoomba and Richmond in NSW; Tuggeranong in the ACT; Alice Springs, Katherine and Tennant Creek in the NT; Exeter and Bridgewater in Tasmania; Broome, Geraldton, Kalgoorlie and Port Headland in WA; Cloncurry, Esk, Gympie, Kelso, Mt Isa, Nerang, Port Douglas and Yeppoon in Queensland; Ballarat, Corio, Mildura, Swan Hill, Torquay, Hastings, Mornington Peninsula and Seaford in Victoria; and Mt Gambier, Port Wakefield and Piccadilly in SA (Australian Department of Health and Ageing, 2005).

As Australia is highly urbanised, the implication is that most of the population (65%) is over supplied, relative to the national average, with the greatest over supply being in Sydney, where 33% fewer people share a full-time GP, compared to the whole of NSW (Wilkinson, 2000). On the other hand, the greatest under supply is in Queensland with 133% more people sharing one GP. Table 1 shows the unequal distribution of employed practitioners in Australia between the cities, regional and remote areas. It should be noted that over half of the 43,010 practitioners employed in cities were specialists (14,580), specialists-in-training (5,116) or non-clinicians (3,621) (Australian Institute of Health and Welfare, 2005).

Table 1: Employed practitioners in Australia, 2000 to 2003

Occupation	FTE rate (a)									
	Major cities		Inner regional		Outer regional		Remote		Very remote	
	2000	2003	2000	2003	2000	2003	2000	2003	2000	2003
Clinicians	285	294	166	170	139	149	143	154	128	133
Primary care	105	102	88	89	83	85	99	97	100	95
Hospital non-specialist	32	36	18	17	13	19	21	24	21	30
Specialist	108	115	51	55	34	36	17	26	N/A	7
Specialist-in-training	40	42	9	9	10	10	6	7	5	N/A
Non-clinicians	25	26	6	8	8	10	10	9	10	10
Total	**309**	**321**	**172**	**178**	**147**	**159**	**152**	**163**	**138**	**143**

Source adapted from: Australian Institute of Health and Welfare, 2005, *Medical Labour Force 2003*, p. 12.
(a) FTE rates are per 100,000 population and based on a 45-hour week.

These findings confirm the well-documented fact that rural Australians have poorer access to medical services than their urban counterparts, as in the U.S., Canada and Britain (Ellsbury, Doescher & Hart, 2000; Wilkinson, 2000). Wilkinson *et al.* (1999) go further to suggest that 10-13% more GPs are required in Australia to ensure an equal national allocation. However, it should be noted that the accuracy of these predictions is questionable because the study used Census data reporting where GPs live and not where they work. Therefore, more research is needed in this area. In the next section, we focus on the discussion in the literature on three areas of supply imbalance: rural versus urban, government versus private, and the imbalance of professional specialisations.

2.1 Geographical Imbalance of Supply

Geographical imbalances are a concern in most countries (Blumentahl, 1994). The most worrying problem in many health systems is the rising trend of rural-to-urban brain drain. Adams & Hicks (2000) argue that in both industrialised and developing countries, urban

areas almost invariably have a substantially higher concentration of physicians than rural areas. They further add that while this pattern is not surprising, given that most healthcare professionals would prefer to settle in urban areas, where there are more opportunities and amenities; it is in the rural and remote areas that the most severe public health problems are found.

Countries such as Australia have attempted to retain and deploy doctors in rural areas through a variety of methods. Van Lerberghe, Conceicao, Van Damme & Ferrinho (2002b) provide a discussion on such measures which include decentralising the location of training institutions, introducing recruitment quotas to ensure that the most peripheral areas are represented among medical students, and making rural field experience compulsory during medical training. They conclude that the results are mixed; the main constraint being the inequitable socio-economic development of rural areas compared to urban areas and the comparative social, cultural and professional advantages of cities. Cities offer doctors more opportunities to diversify earnings by working both in the government sector and in private practice. This rural-to-urban flow is compounded by government-to-private practice brain drain (Van Lerberghe *et al.*, 2002b).

2.2 Supply Imbalance between Government and Private Sectors

In the literature (for example Humphrey & Russell, 2004; Gruen, Anwar, Begum, Killingsworth, & Normand, 2002; Van Lerberghe, Adams, & Ferrinho, 2002a; Van Lerberghe *et al.*, 2002b), it is widely acknowledged that government health employees

boost their incomes with private practice; and sometimes in an ambiguous context that compromises their government related responsibilities. Often, the result is a supply imbalance between the government and private sectors. The dual system of healthcare delivery adopted in many developed and developing countries has unintentionally promoted this development. From a sample of 40 developing countries it has been found by Hanson & Berman (1998) that an average of 55% of physicians work in the private sector. Zurn *et al.* (2004) attempt to provide reasons for the unequal allocation of doctors by arguing that characteristics of the health system such as market failure are a cause of supply imbalance. They point out that even if governments attempt to correct market failures through policy interventions, implementing such policies may prove difficult.

Problems can be exacerbated when policy-makers fail to modify their workforce policies according to the changing demands of the population. Keeping in mind that 0.71:1,000 is the ideal GP to population ratio in Australia, between 1984-1985 and 1998-1999 the average number of patients per full-time practising GP fell from 1,407 to 1,045 respectively in the capital cities (Hawthorne *et al.*, 2002). Although the practitioner rate rose from 267 to 283 practitioners per 100,000 population between 2000 and 2003, the average weekly hours worked per practitioner fell from 45.5 hours to 44.4 hours during the same period (Australian Institute of Health and Welfare, 2005). As is shown in Table 1, there was also a greater increase in the supply of practitioners in the major cities and in the outer regional areas (increase of 12 FTE per 100,000 population), than in the very remote areas (increase of 5 FTE per 100,000 population) (Australian Institute of Health and Welfare, 2005). Hence, from the available statistics, it appears that Australia has a

surplus of doctors, especially GPs in some urban locations, but evidence points to the contrary in most rural areas (Prideaux, 2001; Australian Medical Workforce Advisory Committee, 2000).

According to Stoddart *et al.* (1999), Canada was in a similar situation of surplus supply more than a decade ago when concerns were raised regarding the persistent surplus of doctors. In the years leading up to the deliberate policy reduction in doctor supply in Canada, the supply of physicians increased by 170% between 1964 and 1993 while the country's population grew by only 48% (Stoddart *et al.*, 1999). Some of the conditions that led to an over supply in Canada included a major expansion in domestic training capacity, and a lack of distribution across specialties that reflected the changing demands of the population. However, many rural and remote areas of Canada, like Australia, still remained relatively underserviced. On top of this, a modest 3% reduction in the physician/population ratio between 1993 and 1998, although on the heels of an 80% increase in that ratio over the previous 29 years, created an instant shortage (Stoddart *et al.*, 1999). Hence, the above discussion highlights some of the serious effects a supply imbalance can have on the healthcare system.

2.3 Imbalance of Medical Specialisation and Related Incentives

Imbalance within the medical profession itself is a major issue in need of consideration. Table 2 for instance shows that practitioner numbers vary considerably across selected specialties in Australia. Although professional specialisation imbalances can arise for a

multitude of reasons, one important factor is incentives (monetary and normative). The *World Health Report 2000 - Health Systems: Improving Performance* defines incentives as all the rewards and punishments that providers face as a consequence of the organisations in which they work, the institutions under which they operate, and the specific interventions they provide (WHO, 2000).

Table 2: Selected specialties: number of practitioners in Australia, 2000 to 2003

Main occupation	2000	2001	2002	2003	% change 2000-03	% change 2002-03	Average annual change (%)
Specialty of practice							
Anaesthesia (incl. Intensive care - anaesthesia)	2,120	2,368	2,491	2,524	19.10	1.30	6.00
Emergency medicine	341	442	450	470	38.00	4.40	11.30
General surgery	970	924	995	990	2.00	-0.60	0.70
Obstetrics & gynaecology	1,001	1,123	1,119	1,179	17.70	5.40	5.60
Psychiatry	1,984	1,937	2,167	2,177	9.70	0.50	3.10
All specialties	**16,008**	**17,124**	**17,762**	**18,093**	**13.00**	**1.90**	**4.20**

Source: Australian Institute of Health and Welfare, 2005, *Medical Labour Force 2003*, p. 6.

It has also been noted in the literature (e.g. Adams *et al.*, 2000; Kingma, 1999) that the choice of payment mechanisms in the health system can have major implications for the mode of practice and code of conduct because of the likely tension between financial incentives and professional values. Chaix-Couturier, Durand-Zaleski, Jolly & Durieux (2000) provide an example of such tension. They find for instance that salaried physicians are likely to refer patients to specialists less frequently than fee-for-service physicians. The effects of incentives were studied in three areas: financial impact on providers under capitation or shared-risk plans, risks to the quality of care, and the impact

on patient confidence (Chaix-Couturier *et al.*, 2000; Dudley, Miller, Korenbrot & Luft, 1999; Grumbach, Osmond, Vranizan, Jaffe & Bindman, 1998).

3 REGULATED SUPPLY IN THE FORM OF ENTRY BARRIERS

Literature on the topic of regulation is comparatively limited. This is understandable to a certain extent because while regulation has a role in the health system of most countries, the degree and type of regulations implemented are different from country to country. This makes the task of studying regulations more challenging. Available literature on medical workforce regulation in Australia, although limited, will be the main interest in this section.

The type of regulation governing a profession can have a substantial impact on supply. The medical profession in most developed countries faces strict regulation. Doctors face considerable barriers to entry, which often include direct government intervention, and rules adopted by professional associations, whose self-regulatory powers allow them to set up entry requirements as well as rules of professional conduct (Van den Bergh, 1997; Zurn *et al.*, 2004). Examples include those barriers with respect to the medical training and licensing of local and foreign-born overseas trained doctors. Even though the proponents of regulated supply claim that stringent barriers would promote high quality healthcare and protect patients from incompetent providers, the downside of such regulations is that they can provide the doctors as a group, with enormous market power (Zurn *et al.*, 2004).

As noted by Noether, “economists have long recognised that the market for physician-provided services cannot be described adequately by a purely competitive model” (1986, p. 504). He reminds us that the supply of physicians permitted to practice in the majority of developed countries has been restricted for a considerable period of time. In the U.S. as in other countries, successful barriers to entry have been maintained through a combination of medical school accreditation and mandatory state licensing of individual practitioners (Noether, 1986). The nature of a country’s barriers to entry into medical practice is an unstable factor, which could worsen the problem of supply imbalance. It is important to recognise that the existence of entry barriers to the medical profession in most developed countries is largely a result of the widely held view in the past that there were too many doctors in the medical workforce. In Australia, a range of measures was adopted in the 1990s as a response to the perceived surplus of doctors. Many of these measures, originally aimed to curb expansion of the medical workforce, are still in place today.

The main regulations discussed by Hawthorne *et al.* (2002) and the Australian Medical Workforce Advisory Committee (2000), include reducing the number of medical school enrolments, points penalties to doctors applying to immigrate, the subsequent removal of the right of doctors to apply for migration as permanent residents under Australia’s points tested skilled migration categories, and placing a limitation on the number of entrants to the RACGP’s postgraduate training programme for GPs. Other regulations include restricting access to Medicare provider numbers to those who pass the RACGP training

programme, and placing various restrictions on the circumstances under which foreign-born overseas trained doctors can practise if they enter Australia with temporary employment contracts.

The urgent demand for more doctors has led to a lowering of some of these entry barriers (e.g. employing more foreign-born overseas trained doctors on a temporary basis) to cope with an ageing population, an increase in the number of women in the medical workforce, public pressure for improved access and quality, and the growing shortage of doctors in rural areas (Australian Medical Workforce Advisory Committee, 2000). Consequently, the new policies introduced in Australia are to some extent contrary to the previous ones. To ease the shortage of GPs, particularly in rural Australia, foreign-born overseas trained doctors are offered contracts to work in pre-arranged employment. There has been a considerable increase in the number of overseas trained doctors arriving in Australia annually.

Hawthorne *et al.* (2002) who studied the Australian situation have noted the surge in demand for temporary resident visas each year: 1,923 visas were issued in 2001-2002 compared to 1,209 in 1997-1998, and just 664 in 1993-1994. Hence, owing to difficulties faced by employers in recruiting locally trained doctors (especially in specialisations and in locations where there are serious shortages), the Federal, State, Territory and Local Governments are now increasingly forced to rely on foreign-born overseas trained doctors to provide healthcare services in Australia (Hawthorne *et al.*, 2002).

Despite Australia's growing reliance on foreign-born overseas trained doctors the official view of the Australian Government is that there continues to be a surplus of doctors and "… that there is a distribution problem, not a deficiency problem" (Hawthorne *et al.*, 2002, p.57). However, this view is not held by the Australian Medical Association (AMA), which argues that there is no surplus of GPs in urban areas. In other developed countries similar developments have been observed. For example, public concern regarding the shortage of physicians in the U.S. has led to a substantial increase in the number of medical schools, and the number of medical graduates has more than doubled since the 1960s (Noether, 1986).

In 1999, British authorities decided to expand the medical school intake by roughly 20%, and considered strategies to minimise medical student dropout rates (Goldacre, 1998). In Canada medical school enrolments have risen to solve the doctor supply problem (Stoddart *et al.*, 1999). The general view in the literature is that the U.S., Canada and Britain are yet to achieve the objectives of their national medical workforce policies, that is, to train enough doctors locally to achieve self-sufficiency without relying on immigration, and to ensure that supply best matches demand (Goldacre, 1998; Horvath, Gavel, Harding, & Harris, 1998; Sullivan, Watanabe, Whitcombe & Kindig, 1996).

4 MOBILITY TRENDS AMONG MEDICAL PRACTITIONERS

Most relevant to our discussion on the supply imbalance of doctors is the extent of their labour mobility. Migration can be either internal or international, and we will look at the

literature on these types of migration. Diallo (2004) defines internal migration as the movement of doctors within national borders, across subnational administrative units, or between rural and urban areas. On the other hand, international migration describes the movement of doctors who temporarily or permanently settle abroad, mainly because of problems in their home country. Such international migrants may include those who are no longer working in the area of healthcare in the host country, foreign-born trainees and graduates who do not return to their home country, and migrants who eventually return to their home country and continue to work in healthcare (Diallo, 2004). Physicians in particular, tend to move abroad for training purposes (Forcier, Simoens & Giuffrida, 2004).

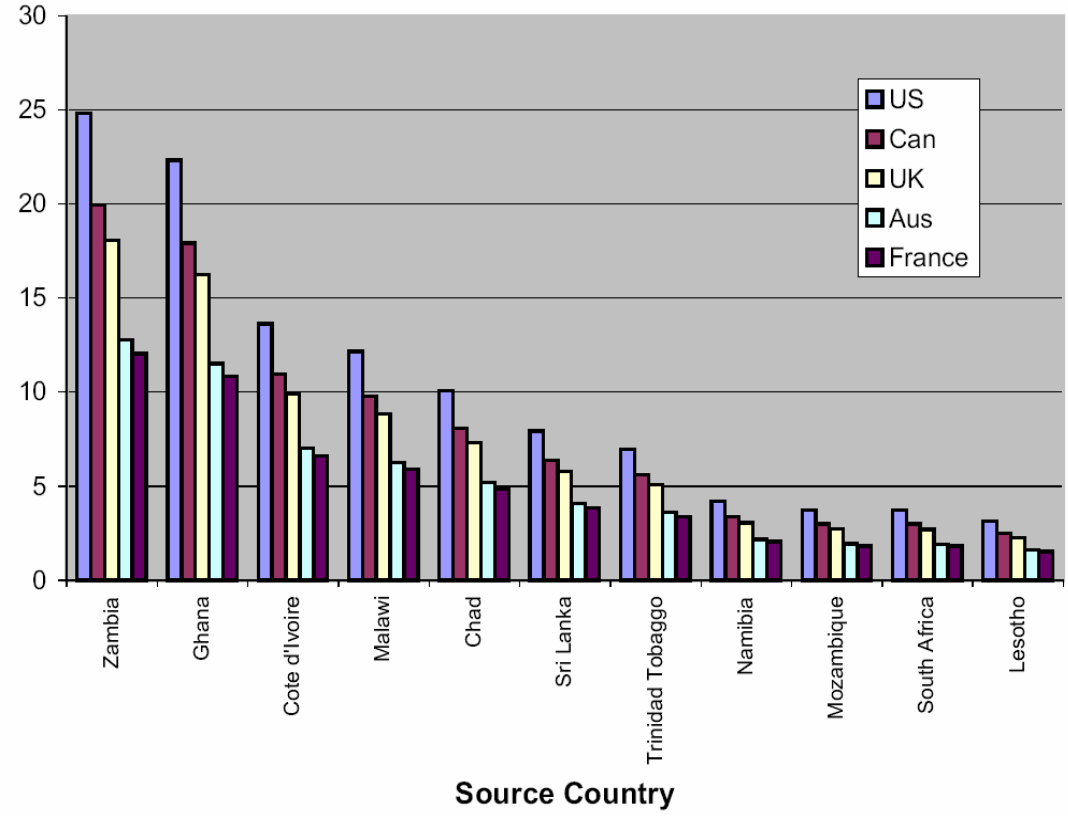
While migration can offer considerable benefits to both the home (the country from which the doctor is migrating) and the host (the country to which the doctor is migrating) countries, it can also create costs for the home and the host countries. The cost effects are rarely felt as strongly as in the healthcare sector. Brain drain not only can lead to severe repercussions for the home country, but may also produce consequences for the host country, especially if it is an economically developed country. Therefore, it is imperative to look into the literature on the impact of migration on the supply of doctors in various countries. The international migration of physicians is a prominent issue in the 21st Century. This fact is widely documented in the literature including Diallo (2004), Martineau, Decker & Bundred (2004), Pang, Lansang & Haines (2002), Saravia & Miranda (2004), Vujicic, Zurn, Diallo, Adams & Dal Poz (2004), and Stilwell, Diallo, Zurn, Dal Poz, Adams & Buchan (2003). They all attribute this migration to several

factors such as the lack of opportunity in home countries, a shortage of doctors in host countries, and rising demand for medical services as a result of the ageing population.

Although both financial and non-financial incentives can motivate health professionals to relocate to another country as pointed out by Brown & Connell (2004) and Stilwell, Diallo, Zurn, Vujicic, Adams & Dal Poz (2004), enhanced employment prospects and the possibility of making substantially more money are the most commonly cited reasons for migrating to another country (Harrison, 1998; Stilwell *et al.*, 2004; Vujicic *et al.*, 2004). These factors can have serious implications for the health systems of the home and the host countries.

In fact, Vujicic *et al.* (2004) have found that, even after adjusting for the difference in the cost of living, wage differences are large in their study, having carried out an analysis of data on wage differentials in the healthcare sector between home and host countries. They cite evidence to show that even in high-wage home countries, health sector salaries constitute only about one-third of the amount of salaries in developed host countries such as Australia, Canada, France, Britain and the U.S. As Figure 2 illustrates, the physician wage in the U.S. is roughly 25 times the physician wage in Zambia, approximately 22 times the physician wage in Ghana, and about 4 times the physician wage in South Africa (Vujicic *et al.*, 2004). Accordingly, they suggest that wage differentials between home and host countries are so large that small increases in healthcare wages in home countries are unlikely to have a major impact on the migration decision of doctors (Vujicic *et al.*, 2004).

Figure 2: Ratio of physician wages (PPP$US), host country to home country

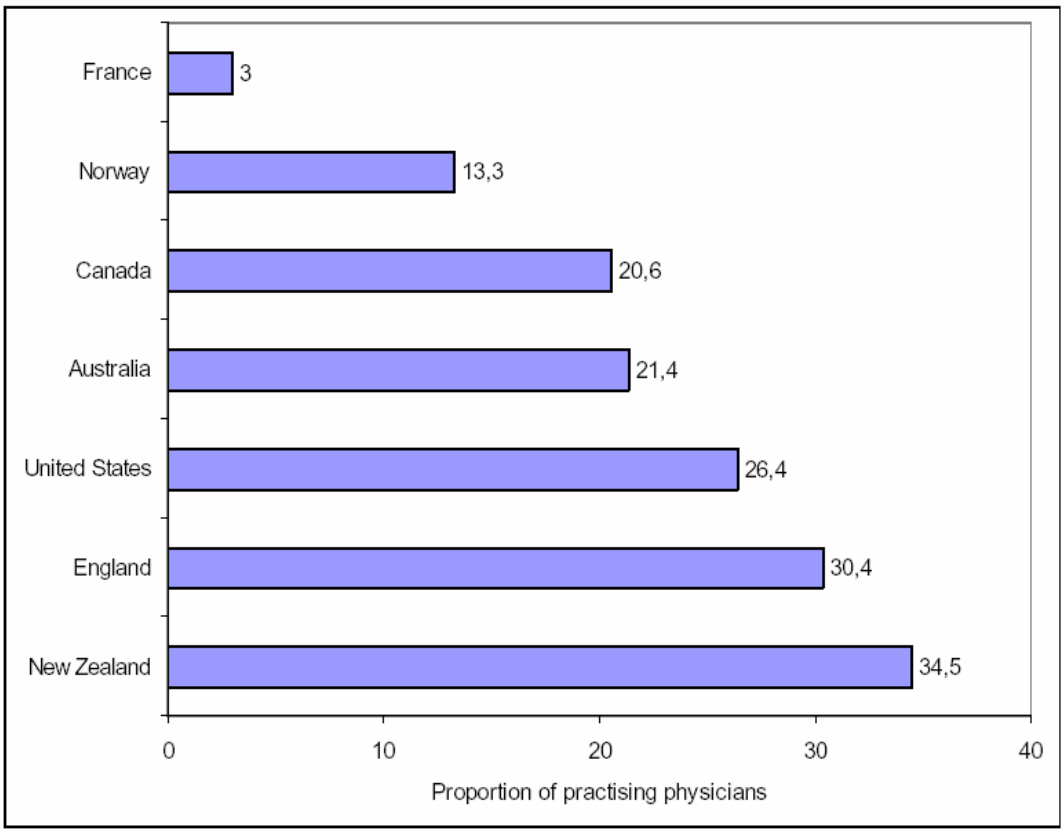


Source: Vujicic, Zurn, Diallo, Adams & Dal Poz, 2004, 'The role of wages in the migration of health care professionals from developing countries', *Human Resources for Health*, p. 9.

The trend in the inflow of foreign-born overseas trained doctors is clearly different among the host countries, but the literature is uncertain on whether doctors make up the bulk or only a small proportion of the skilled migrants (Stilwell *et al.*, 2003; Martineau *et al.*, 2004). Researchers seem to hold opposing views on how the trend of inflow of foreign-born physicians has fluctuated. For instance, according to Vujicic *et al.* (2004) the proportion of foreign-born overseas trained doctors in Canada has decreased quite considerably. This view contradicts the findings of Forcier *et al.* (2004) who argue that foreign-born physicians make a substantial contribution (20.6%) to the national supply of

physicians in Canada. In other western OECD countries they also comprised more than 20% of the total physician workforce in 2000 (see Figure 3).

Figure 3: Percentage of practising foreign-born overseas trained doctors, 2000



Source: Forcier, Simoens & Giuffrida, 2004, 'Impact, regulation and health policy implications of physician migration in OECD countries', *Human Resources for Health*, p. 4.

Foreign-born overseas trained doctors can offer numerous benefits to host countries because foreign-born physicians are usually recruited to fill the gaps in local medical labour supply. The greatest benefit is that they are more flexible and willing than local-born doctors to practise in less popular workplace settings. These may include less favourable working conditions such as night shifts, and certain geographical areas such as the rural areas, which many local-born physicians tend to avoid (Bundred & Levitt, 2000;

Forcier *et al.*, 2004; Martineau *et al.*, 2004; Williams, 1998). Recruitment of foreign-born overseas trained doctors to work in rural areas is not new; it is a convenient strategy to solve the problem of inadequate local supply in developed countries such as Australia, the U.S. and Britain. According to Table 3, the largest group of foreign-born overseas trained doctors employed in Australia between 1994 and 1996, were born in South Africa (75.3%) and Britain/Ireland (74.8%). However, as this data is a decade old, and more recent data is difficult to obtain, there is a need for a more updated study in this area.

Table 3: Labour market outcomes for foreign-born overseas trained doctors by country/region of birthplace, 1994-1996 arrivals

Birthplace	Employment outcomes in Australia, percentage				Total number
	Doctors	Other professionals	Unemployed	Number in labour force	
South Africa	75.30	11.10	0.00	9.90	81
Britain/ Ireland	74.80	11.50	0.00	10.40	469
India	50.20	4.50	11.70	31.30	265
Hong Kong	40.50	25.70	4.10	4.10	74
Malaysia	38.70	19.40	9.70	32.30	31
Vietnam	30.00	0.00	15.00	47.50	40
Southern Europe	10.20	0.00	30.50	59.30	59
Philippines	7.90	7.90	23.70	50.00	38
China	3.00	11.20	12.90	57.90	394
Russia/ Balkans	2.70	2.70	16.10	67.90	112
Lebanon	0.00	0.00	0.00	0.00	0
Other	39.90	8.30	10.80	33.80	1,241
Total overseas	39.90	9.00	9.70	33.80	2,804

Source adapted from: Hawthorne *et al.*, 2002, p. 59.

Other benefits for the host country include free riding on potential savings to be made from the cost of training and education (Martineau *et al.*, 2004). Patients in the host country may benefit by better access to medical care and even reduced prices arising from increased competition between doctors, which may eventually improve the quality of services (Forcier *et al.*, 2004). However, Martineau *et al.* (2004) warn that the host countries should see the recruitment of foreign-born physicians as only a temporary solution to their supply problems. Continuous reliance on migrant doctors may hinder the development of locally trained supply, and in some cases, there could be tension between the local interests of the country and its policy on overseas recruitment (Martineau *et al.* 2004).

Widespread international migration can in turn lead to what is known as rural-to-urban brain drain in the home countries. The ultimate losers of international migration tend to be the health service users in the rural areas because rural areas often come lowest in the ranking of preferred work locations. Thus, if a vacancy in the city arises owing to the incumbent migrating overseas, a reshuffle takes place whereby the rural physician fills the city vacancy (Martineau *et al.*, 2004). Urban areas are often perceived to be more accommodating with respect to professional, family and social connections, and achieving professional ambitions (Zurn *et al.*, 2004).

The other main reasons for the high concentration of GPs in the cities are lifestyle-related (urban areas offer better access to amenities), spouse-related (more employment opportunities), and child-related (better schools and access to universities). However,

despite the seriousness of this issue, the available literature on the rural-to-urban brain drain of doctors is very limited compared to the literature on international migration. This may be because it is generally more difficult to collect data on mobility trends within a country than mobility trends from one country to another. “So far there is virtually no country in the world that has solved the problem of a rural/urban imbalance of the physician workforce” (Zurn *et al.*, 2004, p. 11).

5 SOME SOLUTIONS TO THE SHORT SUPPLY

In their 2002 paper, Alwan and Hornby put forward what they believe to be the main obstacles facing human resources development in the health sector in many countries. They argue that in most countries there is no comprehensive national health development plan or strategy for health sector development, the prerequisites for health staff development are not in place, and the education programmes of academic institutions are not linked to the demands of the country. They also observe that policies of admission to the medical profession are unrealistic, insufficient attention is given to continuing education, primary healthcare and non-clinical activities are overlooked, and there is often little or no coordination between ministries of health, universities, training institutions and the demands of the population at large.

Alwan *et al.* (2002) propose that each country should develop a national strategy for human resources for health, taking into account all of the above obstacles. While the development of such a broad strategy may not be easy and could take time, there are

other more specific and practical strategies that many countries could adopt to solve the problem of an unequal allocation of doctors from the geographical and sectoral aspects. For instance, Wibulpolprasert (1999) suggests that development of a rural health infrastructure will assist the allocation of doctors to rural areas. He has proposed a number of educational strategies to increase doctor supply. First, students could be recruited from rural areas for medical school admission, and there should be hometown placement after graduation. Medical students should be encouraged to acquire rural experience by utilising rural health facilities for training purposes. Lastly, fewer opportunities for private practice should be provided so that more medical graduates are kept in the government sector.

Wibulpolprasert (1999) stresses that for these strategies to be effective the student recruits should be limited to those who grew up in the rural areas, and exclude those who purposely move their residence to rural areas 2-3 years before enrolment just to be eligible for admission. This proposal contradicts the current medical recruitment practice in Australia where even students living in the cities are allowed to apply for admission to rural medical schools. “Only consistent, integrated, unified rational strategies supported by social and political commitment can guarantee the success of solving social inequity and inequity in the distribution of doctors” (Wibulpolprasert, 1999, p. 21).

Wibulpolprasert (1999) also notes that rural recruitment and training has proved to be quite effective in achieving rural allocation of doctors in Australia and the U.S. Moreover, he states that the establishment of regional medical schools is a good measure

for a more balanced allocation of doctors. A measure that could keep medical graduates in the government sector is to provide medical licenses to graduates only after they have completed a period of government work (Wibulpolprasert, 1999).

Whilst it is unlikely that the debate regarding doctor shortage in Australia will be settled soon, there are some steps the government could immediately take to improve the supply situation. It is important for policy-makers to realise that the reliance on foreign-born overseas trained doctors to fill the gaps in supply cannot be a permanent solution. Therefore, it is difficult to see how the medical workforce crisis can be solved without increasing the number of doctors being trained in Australia (Hawthorne *et al.*, 2002). This means that the current quota for medical school places in Australia will have to increase and more funding should be allocated to medical schools.

As Prideaux (2001) points out, all of the government funded medical schools in Australia have suffered cuts in their operating grants since 1996 (the term of the current Australian Government). This has come on top of a major restructuring of Australian universities at the beginning of the 1990s, as well as cuts in the funding of government hospitals for more than a decade, including all teaching hospitals. This suppressive environment has made it difficult for medical schools to enhance their programmes in an appropriate and effective way (Prideaux, 2001). Another move to improve supply is to increase the number of places available under the RACGP's postgraduate training programme for GPs in order to address the chronic shortage of GPs, particularly in rural areas (Hawthorne *et al.*, 2002). At least a step in the right direction is the Australian Government funding for a

medical school at James Cook University in Northern Queensland, and nine more rural clinical schools around Australia, including Victoria's first rural medical school at Deakin University, the University of Western Sydney, University of Wollongong and the University of Notre Dame (Australian Medical Workforce Advisory Committee, 2000).

Given the inadequacy of the academic literature in this important area, more studies need to be conducted on the impact of regulation on the supply of doctors. The newly emerging trend of setting up private medical schools has occurred not only in Australia but also in other countries. While the establishment of new medical schools, especially private medical schools, is a highly controversial issue in Australia, the benefits and costs of this relatively new phenomenon is yet to be analysed in the literature. In fact, the overall literature on private medical schools is inadequate.

The main concerns that have surfaced with respect to private medical schools are to do with equality of opportunities. As for new medical schools in general, the Australian Medical Students Association (AMSA) believes that they should only be established if doing so would serve the section of the Australian population currently under-represented in the demography of medical students and graduates (Australian Medical Students Association, 2002). For example, the medical school at James Cook University (Australia's only rural medical school) was established with the main purpose of increasing the enrolment of students from rural and indigenous backgrounds (Prideaux, 2001).

Currently, the Australian medical student population is composed mainly of students from the higher income groups who can afford to pay the Higher Education Contribution Scheme-Higher Education Loan Programme (HECS-HELP) fees for medicine costing a total of approximately $50,000 for a 6-year course. As a result, a major equity issue has arisen with regards to medical education in the belief that prospective medical students from a relatively high socio-economic background may have a better chance of studying medicine than those from a lower socio-economic background (Australian Medical Students Association, 2002). Hence, for the moment at least, the demography of medical students cannot be described as egalitarian. The creation of private medical schools may compound this problem because private universities would charge fees higher than HECS-HELP. For instance, local students in the new medical programme at Bond University on the Gold Coast must pay $46,620 in tuition fees per annum, with annual increments reflecting increased costs (Bond University, 2006).

6 CONCLUSION

The aim of this paper was to review the current literature on the supply of doctors in developed and developing countries, focusing particular attention on Australia. With this in mind, the paper evaluated the literature that was the most relevant to policy-makers in the area of medical workforce planning. The literature review was confined to (1) mobility issues relating to geographical and sectoral imbalances, (2) incentive issues (monetary and non-monetary) relating to medical specialisation imbalance and (3) government regulation issues relating to geographical, sectoral and professional

specialisation imbalances. The paper utilised the definition of doctor shortage and the accepted ratio of patients to FTE doctors that was provided by the Australian Government's Department of Health and Ageing. The department considers 0.71:1,000 to be the standard doctor to population ratio, and uses this as a measure to demonstrate comparative workforce shortage (Australian Department of Health and Ageing, 2005).

With respect to geographical and sectoral imbalances, the findings clearly indicate that rural-to-urban brain drain is a considerable problem in many developed countries. For example, the findings confirm that rural Australians have poorer access to medical services in comparison to their urban counterparts, and this situation is also present in the U.S., Canada and Britain. To remedy the situation, Australia has tried to retain and deploy doctors in rural areas utilising various methods. However, the results have been mixed. Government-to-private practice brain drain has also been found to compound rural-to-urban brain drain.

Government regulation can further exacerbate the supply imbalance problem. In most developed countries including Australia, entry barriers were initially put in place as a result of the view that there were too many doctors in the medical workforce. However, due to the growing shortage of doctors, especially in rural areas, many of these entry barriers have since been lowered. Now governments in Australia are forced to rely on foreign-born overseas trained doctors to provide healthcare services. This however, is not a lasting solution to this problem. More permanent solutions include increasing the quota for medical school places in Australia, and allocating more funding to medical schools

and teaching hospitals. Other policy suggestions to rectify supply imbalance in developed and developing countries include establishing rural health infrastructure to assist in the allocation of doctors to rural areas, recruiting student from rural areas for medical school admission, and restricting opportunities for private practice so that medical graduates are kept in the government sector.

REFERENCES

Adams, O. and Hicks, V. (2000) 'Pay and non-pay incentives, performance and motivation', *Human Resources for Health Development Journal*, **4(3)**, pp. 126-145.

Alwan, A. and Hornby, P. (2002) 'The implications of health sector reform for human resources development', *Bulletin of the World Health Organization*, **80(1)**, pp. 56-60.

Australian Department of Health and Ageing (2005) 'Health Workforce Definition', http://www.health.gov.au/internet/wcms/Publishing.nsf/ Content/health-workforce-bmp-definition.htm, June 2005. Visited 27 March, 2006.

Australian Institute of Health and Welfare, (2005) *Medical Labour Force 2003*. Canberra: Australian Institute of Health and Welfare.

Australian Medical Students Association, (2002) 'AMSA policy and the University of Notre Dame Australia: new private medical schools', *New Doctor*, **77**, pp. 22-24.

Australian Medical Workforce Advisory Committee (2000) 'Innovations in medical education to meet workforce challenges', *Australian Health Review*, **23(4)**, pp. 43-59.

Blumentahl, D. (1994) 'Geographic imbalances of physician supply: an international comparison', *Journal of Rural Health*, **10(2)**, pp. 109-118.

Bond University (2006) 'Background', http://www. bond.edu.au/hsm/medicine/student, January 2006. Visited 7 February, 2006.

Britt, H., Miller, G. C., Knox, S., Charles, J., Valenti, L., Henderson, J., Pan, Y., Sutton, C. and Harrison, C. (2002) *General practice activity in Australia 2001-02*. Canberra: Australian Institute of Health and Welfare.

Brown, R. P.C. and Connell, J. (2004) 'The migration of doctors and nurses from South Pacific Island Nations', *Social Science and Medicine*, **58**, pp. 2193-2210.

Bundred, P. E. and Levitt, C. (2000) 'Medical migration: who are the real losers?', *The Lancet*, **356**, pp. 245-246.

Chaix-Couturier, C., Durand-Zaleski, I., Jolly, D. and Durieux, P. (2000) 'Effects of financial incentives on medical practice: results from a systematic review of the literature and methodological issues', *International Journal for Quality in Health Care*, **12(2)**, pp. 133-142.

Council on Graduate Medical Education, (1994) *Recommendations to improve access to health care through physician workforce reform*. Washington: U.S. Department of Health and Human Services.

Diallo, K. (2004) 'Data on the migration of health-care workers: sources, uses, and challenges', *Bulletin of the World Health Organization*, **82(8)**, pp. 601-607.

Diallo, K., Zurn, P., Gupta, N. and Dal Poz, M. (2003) 'Monitoring and evaluation of human resources for health: an international perspective', *Human Resources for Health*, **1(3)**, pp. 1-13.

Dudley, R., Miller, R. and Korenbrot, Luft H. S. (1999) 'The impact of financial incentives on quality of care', *The Milbank Quarterly*, **76**, pp. 649-686.

Ellsbury, K. E., Doescher, M. P. and Hart, L. G. (2000) 'US medical schools and the rural family physician gender gap', *Family Medicine*, **32(5)**, pp. 331-337.

Forcier, M. B., Simoens, S. and Giuffrida, A. (2004) 'Impact, regulation and health policy implications of physician migration in OECD countries', *Human Resources for Health*, **2(12)**, pp. 1-11.

Goldacre, M. (1998) 'Planning the United Kingdom's medical workforce', *British Medical Journal*, **316**, pp. 1846-1847.

Gravelle, H. and Sutton, M. (1998) 'Trends in geographical inequalities in provision of general practitioners in England and Wales', *The Lancet*. **352**, pp. 1910.

Grossman, M. (1972) 'On the concept of health capital and the demand for health', *Journal of Political Economy*, **80**, pp. 223-225.

Gruen, R., Anwar, R., Begum, T., Killingsworth, J. R. and Normand, C. (2002) 'Dual job holding practitioners in Bangladesh: an exploration', *Social Science and Medicine*, **54**, pp. 267-279.

Grumbach, K., Osmond, D., Vranizan, K., Jaffe, D. and Bindman, A. B. (1998) 'Primary care physicians' experience of financial incentives in managed-care systems', *New England Journal of Medicine*, **339(21)**, pp. 1516-1521.

Hanson, K. and Berman, P. (1998) 'Private health care provision in developing countries: a preliminary analysis of levels and composition', *Health Policy and Planning*, **13(3)**, pp. 195-211.

Harrison. M. E. (1998) 'Female physicians in Mexico: migration and mobility in the lifecourse', *Social Science and Medicine*, **47(4)**, pp. 455-468.

Hawthorne, L. and Birrell, B. (2002) 'Doctor shortages and their impact on the quality of medical care in Australia', *People and Place*, **10(3)**, pp. 55-67.

Horvath, J., Gavel, P., Harding, J. and Harris, M. (1998) 'Micro planning of the Australian medical workforce', paper presented to the Third International Medical Workforce Conference, Cambridge.

Humphrey, C. and Russell, J. (2004) 'Motivation and values of hospital consultants in south-east England who work in the national health service and do private practice', *Social Science and Medicine*, **59**, pp. 1241-1250.

Kennedy, B., Kawachi, I. and Prothrow-Stith, D. (1996) 'Income distribution and mortality: cross sectional ecological study of the Robin Hood Index in the United States', *British Medical Journal*, **312**, pp. 1004-1007.

Kingma, M. (1999) 'Can financial incentive influence medical practice?', *Human Resources for Health Development Journal*, **3(2)**, pp. 121-131.

Margolis, H. (1982) *Selfishness, altruism and rationality*. Cambridge: Cambridge University Press.

Martineau, T., Decker, K. and Bundred, P. (2004) '"Brain drain" of health professionals: from rhetoric to responsible action', *Health Policy*, **70**, pp. 1-10.

Mooney, G. (2003) *Economics, medicine and health care*. Harlow: Prentice Hall.

Noether, M. (1986) 'The growing supply of physicians: has the market become more competitive?', *Journal of Labor Economics*, **4(4)**, pp. 503-537.

Pang, T., Lansang, M. A. and Haines, A. (2002) 'Brain drain and health professionals: a global problem needs global solutions', *British Medical Journal*, **324(7336)**, pp. 499-500.

Prideaux, D. (2001) 'Country report: Australia', *Medical Education*, **35**, pp. 495-504.

Saravia, N. G. and Miranda, J. F. (2004) 'Plumbing the brain drain', *Bulletin of the World Health Organization*, **82(8)**, pp. 608-615.

Secretary of State for Health, (2000) *The NHS plan. A plan for investment. A plan for Reform*. London: HMSO (Cm 4818).

Simoens, S. and Hurst, J. (2006) 'The supply of physician services in OECD countries', *OECD Health Working Papers*, **21**, pp. 1-62.

Stilwell, B., Diallo, K., Zurn, P., Dal Poz, M. R., Adams, O. and Buchan, J. (2003) 'Developing evidence-based ethical policies on the migration of health workers: conceptual and practical challenges', *Human Resources for Health*, **1(8)**, pp. 1-13.

Stilwell, B., Diallo, K., Zurn, P., Vujicic, M., Adams, O. and Dal Poz, M. (2004) 'Migration of health-care workers from developing countries: strategic approaches to its management', *Bulletin of the World Health Organization*, **82(8)**, pp. 595-600.

Stoddart, G. L. and Barer, M. L. (1999) 'Will increasing medical school enrolment solve Canada's physician supply problems?', *Canadian Medical Association Journal*, **161(8)**, pp. 983-984.

Sullivan, R. B., Watanabe, M., Whitcombe, M. E. and Kindig, D. A. (1996) 'The evolution of divergences in physician supply policy in Canada and the United States', *Journal of the American Medical Association*, **276(9)**, pp. 704-709.

Van den Bergh, R. (1997) 'Self-regulation of the medical and legal professions: remaining barriers to competition and the EC-law', paper presented to the Pressure Groups, Self-Regulation and Enforcement Mechanisms Conference, Hamburg.

Van Lerberghe, W., Adams, O. and Ferrinho, P. (2002a) 'Human resources impact assessment', *Bulletin of the World Health Organization*, **80(7)**, pp. 525.

Van Lerberghe, W., Conceicao, C., Van Damme, W. and Ferrinho, P. (2002b) 'When staff is underpaid: dealing with the individual coping strategies of health personnel', *Bulletin of the World Health Organization*, **80(7)**, pp. 581-584.

Vujicic, M., Zurn, P., Diallo, K., Adams, O. and Dal Poz, M. R. (2004) 'The role of wages in the migration of health care professionals from developing countries', *Human Resources for Health*, **2(3)**, pp. 1-14.

Wharrad, H. and Robinson, J. (1999) 'The global distribution of physicians and nurses', *Journal of Advanced Nursing*, **30(1)**, pp. 109-120.

Wibulpolprasert, S. (1999) 'Inequitable distribution of doctors: can it be solved?', *Human Resources for Health Development Journal*, **3(1)**, pp. 2-22.

Wilkinson, D. (2000) 'Inequitable distribution of general practitioners in Australia: analysis by state and territory using census data', *Australian Journal of Rural Health*, **8**, pp. 87-93.

Wilkinson, D. and Symon, B. (1999) 'Inequitable distribution of general practitioners in Australia: estimating need through the Robin Hood Index', *Australian Journal of Public Health*, pp. 71-75.

Williams, K. (1998) 'Underpaid, undertrained and over here', *British Medical Association News Review*, pp. 16-18.

World Bank, (1993) *World Development Report 1993: investing in health*. New York: Oxford University Press.

World Health Organization, (2000) 'World Health Report 2000 - Health Systems: Improving Performance', http://www.who.int/whr/2000/en/, August 2000. Visited 10 October, 2004.

Zurn, P., Dal Poz, M. R., Stilwell, B. and Adams, O. (2004) 'Imbalance in the health workforce', *Human Resources for Health*, **2(13)**, pp. 1-21.